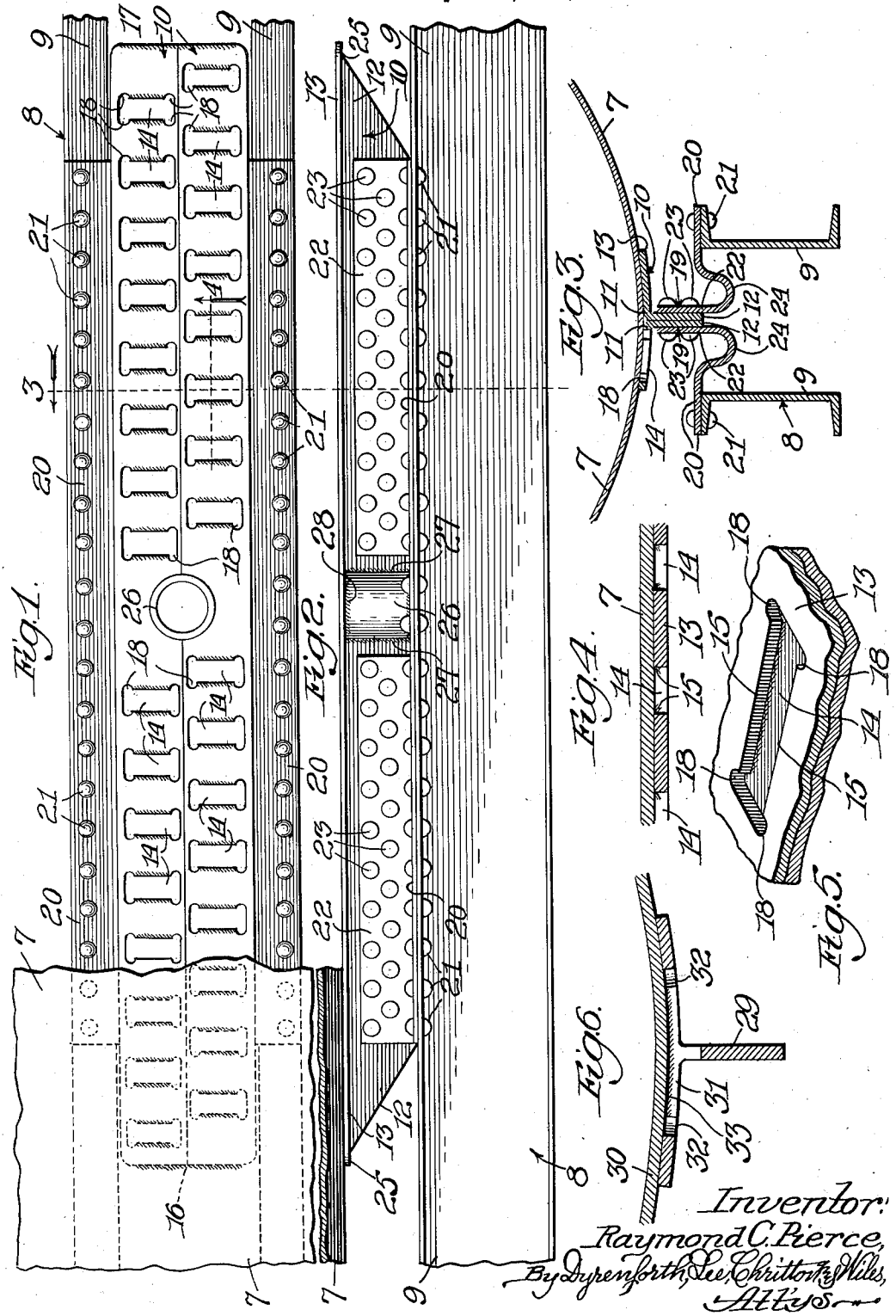
Oct. 27, 1936. R. C. PIERCE 2,059,025

TANK CAR

Filed April 8, 1935



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Patented Oct. 27, 1936 2,059,025

UNITED STATES PATENT OFFICE

2,059,025

TANK CAR

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Application April 8, 1935, Serial No. 15,299

22 Claims. (Cl. 105—362)

My invention relates more particularly, as to one phase thereof, to anchors for tank cars; and as to another phase to the outlet legs thereof.

As regards the tank anchor feature, the invention relates particularly to an autogenous welded anchor, and as to the outlet leg feature to the novel coordinating of the leg with the anchor whereby it virtually becomes a part thereof.

Generally stated, my primary object is to so improve upon tank car structures that danger of failures at the anchors thereof will be reduced to the minimum.

In this connection it may be stated that tank cars in practice are subject to many different forces exerting different stresses at the anchored portion of the tank tending to impair the structure: in the case of wear of the bolster slabbing the tank becomes partly supported on the anchor resulting in shearing and bending stresses in the tank bottom; when cars are coupled together particularly when the slabbing for the tanks has worn and the tank bands are loose, there are strong vertical forces acting on the ends of the tanks, the tank tends to jump off the slabbing at one end which tends to reverse the stresses in the bottom of the tank shell at the anchor and results in tensile forces between the tank shell and the anchor: in addition to the above, twisting forces on the underframe are set up tending to twist the underframe in a horizontal direction with reference to the tank.

Thus the stresses on the anchor and the bottom of the tank shell at the anchor and which much be resisted thereby to render the structure most practicable, are most complicated and of great magnitude, the forces of the greatest magnitude being longitudinal forces due to buffing, this condition having presented considerable difficulty particularly in the designing of cars having welded tank anchors especially as welding tends to change the structure of a metal to a considerable depth and introduces stresses beyond the elastic limit of the metal which, if not relieved, may in turn result in fatigue failures particularly because of the coarsened grain structure as a result of the welding.

It is thus another object of the invention to provide such a construction as will meet these requirements and will minimize the danger of weakening the structure because of the action produced by the welding heat on the metal.

Other objects of the invention will be manifest from the following description.

Referring to the accompanying drawing:

Figure 1 is a broken plan view of a tank car the tank shell of which is anchored to the underframe in accordance with my invention.

Figure 2 is a view in side elevation of the structure shown in Fig. 1.

Figure 3 is a broken sectional view, the section being taken at the line 3 on Fig. 1 and viewed in the direction of the arrow.

Figure 4 is a fragmentary vertical sectional view, the section being taken at the line 4 on Fig. 1 and viewed in the direction of the arrow.

Figure 5 is a fragmentary perspective view of the tank shell and anchor, viewing the same from below; and

Figure 6, an enlarged broken view in cross section through a tank shell and anchor constituting a modification of the construction shown in the preceding figures of the drawing.

Referring to the construction shown in Figs. 1–6, inclusive, 7 represents the tank shell of a tank car and which may be of any desirable construction; and 8 represents the underframe of the car shown as of the center sill type comprising channel beams 9 spaced apart and extending lengthwise of the car as commonly provided in accordance with well known practice.

In the particular construction shown, the tank shell 7 is anchored substantially midway between its ends to the underframe 8 leaving the ends of the tank shell to be supported on the underframe in any suitable manner, as for example in accordance with common practice, to permit of the longitudinal movement thereof in contracting and expanding, the ends of the tank shell commonly resting on bolster slabbing and held down by tank bands (not shown).

The anchor shown comprises a section 10 of T-shape in cross section extending along the underframe 8 and the bottom of the tank shell 7, the section 10 being formed of a pair of plates 11 of L-shape in cross section (which may be pressings) positioned back to back at their vertical flanges 12 with their substantially horizontal flanges 13 extending in opposite directions along the underside of the tank shell 7 to form a saddle therefor.

The plates 11 when welded together at their ends and tack welded together along their bottom edges before application to the tank shell form the T-section 10 which may be provided at less expense than were it to be formed of one piece, the portions of the section 10 where the flanges 13 bend outwardly to form the tank saddle possessing a small amount of vertical flexibility which is quite desirable.

In accordance with my invention the tank shell 7 and the saddle-forming flanges 13 of the T-section 10 are corner or fillet welded together but only along lines extending otherwise than lengthwise of the tank, preferably along lines substantially at right angles to the median line of the tank and thus substantially circumferentially of the tank, and the reasons, generally stated, for thus welding the tank to the anchor are as follows:

Welding against the surface of plates tends to change the grain structure of the metal and weaken the plates and while this tendency may be more or less corrected by subsequent annealing and heat treatment, danger of the metal being weakened at the weld always remains and it is therefore highly desirable that the welded structure be so provided that danger from weakened plates by welding will be eliminated or at least reduced to the minimum.

In the case of a cylindrical tank subjected to internal fluid pressure as in the case of tank cars the forces resulting from such pressure and tending to rupture longitudinal joints in the tank are twice as great as such forces tending to rupture circumferential joints in the tank.

Thus by confining the fillet welds between the tank and anchor to fillet welds which extend only in a direction at an angle to the longitudinal axis of the tank, preferably at substantially a right angle thereto and thus circumferentially of the tank, the weakening effect of the welds is minimized as such welds are subjected to only one-half of the force that they would be subjected to if the welds extended lengthwise of the tank.

Furthermore, while welds made in any direction against the surface of the tank will supposedly be of equal strength the A. S. M. E. and A. P. I. welding codes, in the calculation of resistance to buffing stresses, allow a credit for 25% greater strength in welds where the forces are at right angles to the line of the weld than where the forces are parallel with the welds. Thus by confining the fillet welds, attaching the anchors to the tank, in a circumferential direction only, not only is weakening of the tank in the direction of the greatest stresses to the internal pressure avoided, but a 25% increase in strength against buffing forces is obtained, due to the fact that the anchorage forces which are lengthwise of the tank pass through the short angularly disposed welds.

The location of the welds as stated is effected in the construction shown by providing openings 14 in the anchor flanges 13, preferably closed at both ends and shown as elongated in a direction crosswise of the tank shell 7; and welding these anchor flanges to the underside of the tank shell along those edges only of the openings 14 which extend crosswise of the tank shell, namely, the edges 15 as illustrated, and along the end edges 16 and 17 of the flanges 13, the openings 14 of the series thereof in one of the flanges 13 being preferably staggered as shown relative to the openings 14 in the other flange 13.

At each end of each opening 14 are reliefs represented at 18 which serve as means for limiting the welds at the openings 14 to the desired length, namely, of a length equal to the length of the edges 15 whereby all of the welds extend crosswise of the tank shell, as the starting and stopping points for the welding are definitely delineated.

The anchor section 10 is supported on the center sill 8 preferably by flexible connecting means shown as comprising a pair of plates 19 of similar form in cross section having horizontal portions 20 at which they are riveted, as indicated at 21, to the sill-beams 9, vertical portions 22 between which the vertical flanges 12 of the section 10 are interposed and to which they are secured as by rivets 23, and intermediate downwardly bowed portions 24 affording to the plates 19 a certain amount of vertical and torsional flexibility in a horizontal plane and at the same time effectively restraining longitudinal movement of the tank shell, permitting adjustment of the tank shell to worn slabbing and a certain amount of vertical action when the tank bands are loose.

Due to the vertical forces acting on the anchor it is desirable to obtain a certain amount of flexibility between the outer edges of the anchor plates and the bottom of the tank shell. By eliminating all welding within say about 1¾ inches to 2 inches of the lateral edges of the anchor flanges 13 and also by providing the reliefs 18 at the outer ends of the welds, which makes the anchor flanges weaker at the ends of the welds and therefore more flexible, a flexible construction is provided which prevents concentrated bending stresses on the tank shell.

Furthermore, in the particular construction shown the flanges 13 of the anchor are extended longitudinally beyond the vertical flanges 12, as represented at 25 thereby affording flexibility to the anchor between the outer extremities of the vertical flanges 12 and the welds along the edges 16 and 17 of the flanges 13.

The structure also comprises an outlet leg for the tank represented at 26 which is located in line with the vertical flange portion of the anchor section 10, this flange section, together with the saddle forming flange portions thereof, being cut away to receive the leg which is firmly secured to the adjacent ends of the vertical portion of the anchor section 10 as by welding it thereto as represented at 27. The leg 26 is also preferably welded throughout its circumference to the wall of the opening in the saddle portion of the anchor through which it extends, as indicated at 28.

The construction shown in Fig. 6 is the same as that of the preceding figures except that the T-section of the anchor and herein represented at 29 (the tank shell being shown at 30) instead of being formed of separate plate sections as in the case of the T-section 10, is formed as a one-piece structure and contains a single series of crosswise extending elongated openings one of which is shown at 31 and of the same form as the openings 14, with reliefs 32 at both ends of their long edges as explained of the openings 14, this single series of openings arranged to extend substantially equal distances beyond each side of the median line of the saddle being provided instead of the double row of openings 14. The anchor 29 would be connected with the tank shell 30 by welding it only along those walls of the openings 31 which extend crosswise of the anchor between the relief portions 32 as explained above in connection with the construction shown in Figs. 1–4 and as illustrated at 33 of the one wall shown in Fig. 6.

While I have illustrated and described certain constructions constituting embodiments of my invention, I do not wish to be understood as intending to limit it thereto as the same may be variously modified and altered and the invention embodied in other forms of structure without departing from the spirit of my invention.

What I claim as new, and desire to secure by Letters Patent, is:

1. In a tank car, the combination with its underframe, of a tank and means anchoring the tank to the underframe comprising a saddle for the tank to which the tank is welded only along lines disposed otherwise than longitudinally of the tank.

2. In a tank car, the combination with its underframe, of a tank and means anchoring the tank to the underframe comprising a saddle for the tank to which the tank is welded only along lines substantially circumferential of the tank.

3. In a tank car, the combination with its underframe, of a tank and means anchoring the tank to the underframe comprising a saddle for the tank to which the tank is welded at intervals along the tank only along lines disposed otherwise than longitudinally of the tank.

4. In a tank car, the combination with its underframe, of a tank and means anchoring the tank to the underframe comprising a saddle for the tank to which the tank is welded at intervals along the tank only along lines substantially circumferential of the tank.

5. In a tank car, the combination with its underframe, of a tank and means anchoring the tank to the underframe comprising a saddle for the tank to which the tank is welded at intervals along the tank and at its ends only along lines disposed otherwise than longitudinally of the tank.

6. In a tank car, the combination with its underframe, of a tank and means anchoring the tank to the underframe comprising a saddle for the tank to which the tank is welded at intervals along the tank and at its ends only along lines substantially circumferential of the tank.

7. In a tank car, the combination with its underframe, of a tank and means anchoring the tank to the underframe comprising a saddle for the tank formed of a pair of L-shaped members to which the tank is welded only along lines disposed otherwise than longitudinally of the tank.

8. In a tank car, the combination with its underframe, of a tank and means anchoring the tank to the underframe comprising a saddle for the tank formed of a pair of L-shaped members to each of which the tank is welded at intervals along the tank only along lines disposed otherwise than longitudinally of the tank, the lines of weld at one of said members being staggered relative to the lines of weld at the other of said members.

9. In a tank car, the combination with its underframe, of a tank and means anchoring the tank to the underframe comprising a saddle for the tank formed as a one-piece structure and to which the tank is welded only along lines disposed otherwise than longitudinally of the tank.

10. In a tank car, the combination with its underframe, of a tank and means anchoring the tank to the underframe comprising a saddle for the tank to which the tank is welded, portions of said saddle extending outwardly beyond the welds and yieldingly resisting deflection of the tank.

11. In a tank car, the combination with its underframe, of a tank and means anchoring the tank to the underframe comprising a saddle for the tank to which the tank is welded, the welds being inset from the longitudinal edges of the saddle whereby these edges are free to yieldingly resist deflection of the tank.

12. In a tank car, the combination with its underframe, of a tank and means anchoring the tank to the underframe comprising a saddle for the tank to which the tank is welded along the ends of the saddle, and means supporting said saddle set back from the ends of the latter to permit the ends of the saddle to yieldingly resist deflection of the tank.

13. In a tank car, the combination with its underframe, of a tank and means anchoring the tank to the underframe comprising a saddle for the tank to which the tank is welded only along lines disposed otherwise than longitudinally of the tank, portions of said saddle extending outwardly beyond the welds and yieldingly resisting deflection of the tank.

14. In a tank car, the combination with its underframe, of a tank and means anchoring the tank to the underframe comprising a saddle for the tank formed of a pair of L-shaped members positioned to form a T-member, and means engaging the vertical flanges of said members for connecting the latter with said underframe, said saddle being welded to said tank, portions of said saddle at its longitudinal edges extending beyond the welds whereby said portions are free to yieldingly resist deflection of the tank, said members having bends along the upper edges of said flanges and free to flex at said bends.

15. In a tank car, the combination with its underframe, of a tank and means anchoring the tank to the underframe comprising a saddle for the tank formed of a pair of L-shaped members positioned to form a T-member, and means engaging the vertical flanges of said members for connecting the latter with said underframe, said saddle being welded to said tank only along lines disposed otherwise than longitudinally of the tank, portions of said saddle at its longitudinal edges extending beyond the welds whereby said portions are free to yieldingly resist deflection of the tank, said members having bends along the upper edges of said flanges and free to flex at said bends.

16. In a tank car, the combination with its underframe, of a tank and means anchoring the tank to the underframe comprising a saddle for the tank containing elongated openings the long dimensions of which extend crosswise of the tank and welds connecting the saddle at the long edges of said openings to said tank.

17. In a tank car, the combination with its underframe, of a tank and means anchoring the tank to the underframe comprising a saddle for the tank containing elongated openings the long dimensions of which extend crosswise of the tank, said openings having reliefs at the ends of the walls thereof of longer dimension and welds connecting the saddle at the long edges of said opening to the tank.

18. In a tank car, the combination with its underframe, of a tank and means anchoring the tank to the underframe comprising a saddle for the tank containing elongated openings reaching short of the longitudinal edges of the saddle, the long dimensions of said openings extending crosswise of the tank, said openings having reliefs at the ends of the walls thereof of longer dimension and welds connecting the saddle at the long edges of said openings to the tank, whereby the welds extend only crosswise of the tank and the longitudinal edge portions of the saddle are free to yieldingly resist deflection of the tank.

19. In a tank car, the combination with its underframe, of a tank and means anchoring the tank to the underframe comprising a saddle for the tank having endwise spaced apart web portions, an outlet leg for the tank extending up-

wardly through the saddle and between said web portions and welded to the adjacent ends of said web portions.

20. In a tank car, the combination with its underframe, of a tank and means anchoring the tank to the underframe comprising a saddle for the tank having endwise spaced apart web portions, an outlet leg for the tank extending upwardly through the saddle and between said web portions and welded to the adjacent ends of said web portions and around said leg to the saddle through which it extends.

21. A tank-anchoring member comprising a saddle portion containing openings presenting walls extending crosswise of said member and at which the member is to be welded to a tank, said portion having reliefs at the ends of said walls, for the purpose set forth.

22. In a tank car, the combination with its underframe, of a tank and means for anchoring the tank to the underframe comprising a saddle for the tank elongated lengthwise of the tank and to which the tank is welded only along a longitudinal series of lines disposed crosswise of the tank.

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